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ABSTRACT

This study examined the relative intellectual impacts of two- and four-year college educational programs by focusing on changes in reading comprehension, mathematics, and critical thinking skills in 204 freshmen students who attended either a public two-year community college near a large metropolitan area or a public four-year, urban research university. Preliminary data collection included a precollege survey on student demographic characteristics and background data, and the Collegiate Assessment of Academic Proficiency, developed to assess selected general skills typically obtained by students in the first 2 years of college. A follow-up test was administered at the end of the freshman year. With controls made for precollege cognitive skills, age, work, place of residence and enrollment status, two-year college students did as well as their four-year counterparts in terms of freshman year gains in the variables under study. Contains 18 references. (GLR)

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COGNITIVE EFFECTS OF TWO-YEAR AND FOUR-YEAR COLLEGES: A PRELIMINARY STUDY*

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Abstract

This study compared cognitive effects of two-year and four-year colleges. With controls made for precollege cognitive skills, age, work, place of residence and enrollment status, two-year college students did as well as their four-year counterparts in terms of freshman year gains in reading comprehension, mathematics, and critical thinking.

A growing body of research has focused on the relative impact of initial attendance at a two-year versus a four-year college. The vast majority of this research has focused on the socioeconomic payoffs linked to initial enrollment in these different types of postsecondary institutions. The results of this research with respect to educational attainment are reasonably clear. Net of important individual background differences, students who initially enroll in two-year colleges seeking a bachelor's degree are significantly less likely to complete their bachelor's degree in the same period of time as those students who initially enroll in four-year institutions (e.g., Alba and Lavin, 1981; Astin, 1977; Crook and Lavin, 1989; Dougherty, 1987, 1992; Hilton and Schrader, 1986; Temple and Polk, 1986; Velez, 1985). The findings are more ambiguous with respect to labor-market outcomes. When individuals of equal educational attainment and background are compared, the weight of evidence would indicate a general parity between those initially enrolling in two-year colleges and their four-year counterparts in such areas as occupational status, earnings, job stability, unemployment rate or job satisfaction (e.g. Anderson, 1984; Breneman and Nelson, 1981; Smart and Ethington, 1985; Whitaker and Pascarella, 1992).

Although we have learned much from research on socioeconomic outcomes, little or no inquiry has been concerned with the relative intellectual impact of attendance at a two-year versus a four-year college. Some have argued that we might expect two-year colleges to have a less positive impact on the intellectual development of students because such institutions admit students who are less academically prepared and motivated than those admitted to four-year colleges. The result is a normative peer culture that fails to support intellectual or academic effort, paired with a faculty that has lower expectations and places less rigorous demands on student academic performance (e.g. Dougherty, 1987; London, 1978; Neuman and Reisman, 1980). Consistent with this hypothesis there is at least some evidence that two-year college students find it hard to perform as well academically when they transfer to four-year institutions (Cohen and Brawer, 1982; Kintzer and Wattenbarger, 1985).

While it might be argued that this reflects the less rigorous academic preparation in the two-year college, such a finding could also reflect the normal problems inherent in becoming socially and academically integrated in a new institutional setting (Pascarella and Terenzini, 1991).

Beyond these rather indirect, and perhaps ambiguous, findings we know very little about the relative intellectual impacts of two- and four-year college educational programs. This research addresses this issue by means of a focused study of relative one-year changes in reading comprehension, mathematics, and critical thinking in a public two-year college and a four-year research university with a primarily commuter undergraduate student body.

METHOD

Sample and Instruments

The individuals in the sample were 204 incoming freshmen who were part of a pilot study for a large national longitudinal investigation of the factors that influence learning and cognitive development in college. (The study was sponsored by the National Center on Postsecondary Teaching, Learning and Assessment, which is funded by Grant: R117G10037 from the U.S. Department of Education.) The institutional settings were a public two-year community college located near a large metropolitan area and a public, four-year, urban, Research I university with a primarily commuter undergraduate student body. The students were recruited to the study by mail, and from the population of students attending precollege orientation. They were informed that they would be participating in a longitudinal study and that they would receive a generous stipend for their participation. The total population from which the sample was drawn was approximately 6,000 students, enrolled for 6 or more credit hours during their first semester of college. There were approximately 4,500 students meeting this criterion at the four-year institution and

approximately 1,500 students meeting this criterion at the two-year college. Originally, 397 students were recruited to the study, 327 from the four-year institution and 70 from the two-year college. The small initial sample sizes relative to the respective populations reflected budgetary constraints placed on the pilot study.

An initial data collection was conducted at both institutional sites in the fall of 1991. The data collection lasted approximately four hours and students were paid a stipend of $35. The data collected included a precollege survey, that gathered information on student demographic characteristics and background data, and Form 88B of the Collegiate Assessment of Academic Proficiency (CAAP). The CAAP was developed by the American College Testing Program to assess selected general education skills typically obtained by students in the first two years of college, whether in a two-year or a four-year institution (ACT, 1990). The CAAP consists of five, 40 minute, multiple choice test modules, three of which (reading comprehension, mathematics and critical thinking) were the focus of this study.

The CAAP reading comprehension test is 36 items that assess reading comprehension as a product of skills in referring, reasoning, and generalizing. The test consists of four prose passages of about 900 words in length that are representative of the level and kinds of writing commonly encountered in college curricula. The passages were drawn from topics in fiction, the humanities, the social sciences, and the natural sciences. The average KR-20 internal consistency reliabilities for the reading comprehension test range between .84 and .86. The mathematics test consists of 35 items designed to measure a student's ability to solve mathematical problems encountered in many postsecondary curricula. The emphasis is on quantitative reasoning rather than formula memorization. The content areas tested include pre-elementary, intermediate, and advanced algebra, coordinate geometry, trigonometry, and introductory calculus. The KR-20 reliability coefficients for the mathematics test ranged between .79 and .81. The critical thinking test is a 32 item instrument that measures the ability to clarify, analyze, evaluate and extend

arguments. The test consists of four passages that are representative of the kinds of issues commonly encountered in a postsecondary curriculum. A passage typically presents a series of subarguments that support a more general conclusion. Each passage presents one or more arguments and uses a variety of formats, including case studies, debates, dialogues, overlapping positions, statistical arguments, experimental results or editorials. Each passage is accompanied by a set of multiple choice items. The KR-20 reliability coefficients for the critical thinking test ranged from .81 to .82 (ACT, 1990, pp 11-13, 33) .

A follow-up testing of the sample took place in the spring of 1992. This data collection required about 3 1/2 hours and included measures of the students' freshman-year experiences and Form 88A of the CAAP reading comprehension, mathematics and critical thinking modules. Students were paid a second $35 stipend for their participation in the follow-up testing. The final sample, on which complete fall 1991 and spring 1992 data was available, included 35 freshman students at the two-year institution and 212 freshman students at the four-year institution. This represented an overall follow-up response rate of 62.2% (64.85% at the four-year institution and 50% at the two-year college). To control for place of residence during the freshman year, students living on-campus in the four-year institution were excluded from the study. This left 169 commuting freshman students at the four-year institution and 35 freshman students at the two-year college (which is without residential facilities) on whom the analyses were conducted.

Design and Data Analysis

The study design was a pretest-posttest, quasi-experimental design in which comparison groups (two-year versus four-year college freshmen) were statistically equated on salient 1991 precollege variables. The dependent variables were freshman year gains in reading comprehension, mathematics, and critical thinking,

operationalized as spring, 1992 score minus fall, 1991 score on each of the three CAAP tests. ACT has developed a scaled score through standardization and linear equating, which gives different forms of the CAAP modules the same mean and standard deviation. This permits the assessment and comparison of relative group change or gain. Part of gain over time, however, is often an artifact of a person's pretest score, with initially low scorers tending to gain more through regression to mean than initially high scorers. This means that comparison of simple unadjusted gain scores could provide a misleading estimate of relative two-year versus four-year college effects if one of the sample groups starts from an initially lower reading, mathematics or critical thinking score in fall, 1991. To control for this potentially important confounding influence it was necessary to statistically equate all students on 1991 CAAP scores (Pascarella and Terenzini, 1991). Thus, in the estimation of comparative freshman year gains in reading, mathematics, and critical thinking between the two- and four-year college samples analysis of covariance was the basic analytical approach taken. Covariates were: 1) fall, 1991 reading comprehension, mathematics, and critical thinking scores (each employed in analysis of the appropriate freshman year gain score); 2) student age in years as of fall 1991; 3) the total number of credit hours for which the student was enrolled during both semesters of the freshman year; and 4) the total number of hours the student worked per week during both semesters of the freshman year.

The addition of statistical controls for the last three covariates was deemed important for several reasons. First, it was thought that possible differences in age between two- and four-year college students might influence the amount of cognitive change that occurred. Second, we controlled for the total number of credit hours taken because it was judged that this represented a reasonable estimate of an individual student's extent of exposure to the formal academic programs of the respective institutions. Finally, controls were made for hours worked per week as it was felt that extent of work responsibilites could influence a student's level of involvement and commitment to studying and related academic tasks.

RESULTS

The covariance analyses indicated that, when students were staistically equated on fall, 1991 test scores, age, academic credit hours taken and work responsibilities, there were no statistically significant (at alpha = .05) differences between the two-year and four-year college samples in their freshman year gains on the cognitive measures. (The detailed analysis of covariance summaries are available from the first author on request.) Table 1 shows the covariate-adjusted mean freshman year gains for each group in reading comprehension, mathematics and critical thinking. What is most noteworthy from this table is that there is no clear group trend in the adjusted gains. The four-year college freshmen showed nonsignificantly larger gains in mathematics, while the two-year college freshmen exhibited nonsignificantly greater gains in reading comprehension and critical thinking.

Place Table 1 about here

CONCLUSIONS

Contrary to some prevalent notions about the academic rigor of two-year college programs, the evidence from this preliminary longitudinal investigation suggests the possibility of a general parity in the relative educational impact of two-year and four-year colleges. With controls made for precollege cognitive skills, place of residence, age, credit hours taken, and work obligations, no significant differences were found between samples of two-year and four-year college students

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in their freshman year gains in reading comprehension, mathematics, and critical thinking. Moreover, there was no clear overall trend in the nonsignificant differences in gains favoring either the two-year or the four-year sample. (The two-year college sample showed slightly larger gains in reading and critical thinking while the four-year college sample showed slightly larger gains in mathematics.) Since the measures used to assess gain are of demonstrated reliability it is unlikely that the failure to find between-group differences is simply an artifact of measurement error.

Given the rather focused sample and the preliminary nature of the investigation, however, one needs to maintain a degree of caution in interpreting the results. First, the samples are small in an absolute sense, and in a relative sense represent only small percentages of the total popluations from which they were drawn. Second, there is likely to be some bias in our institutional samples simply because these are students who were willing to participate in the study and who remained in college during the freshman year. Thus, we may not be able to generalize the findings to all freshman students at both institutions. What can be said is that when students of equal precollege cognitive ability, age, work responsibilities, and extent of enrollment are considered, a two-year college was generally as effective as a four-year research university in facilitating freshman year cognitive growth. Clearly the results are also based on a rather narrow institutional sample and may not hold for all two-year and four-year colleges. It is quite likely, for example, that the population of two-year colleges is not homogeneous in terms of educational impacts, and it would be imprudent to expect that the particular institutional site employed in this study is perfectly representative of that population. Replication and extension of these findings with multiple institutional samples of two-and four-year college students would be an important contribution to our understanding of the educational impacts of both types of institutions.

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TABLE 1

MEAN COVARIATE-ADJUSTED GAIN SCORES IN READING COMPREHENSION, MATHEMATICS, AND CRITICAL THINKING

GROUP	Reading Comprehension	Mathematics	Critical Thinking
Two-year College Students	1.46	.46	1.48
	(4.23)[a]	(2.94)	(3.50)
Four-year College Students	.46	1.46	.01
	(3.64)	(3.16)	(4.43)

[a] Standard Deviations are in parentheses